

# Occupational exposure to pesticides

## Challenges for research, evaluation and prevention

Conference

28&29

OCTOBER 2014

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# THE USE OF PESTICIDES IN FRENCH VITICULTURE: A TECHNOLOGY TRANSFER GONE WRONG!

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# Introduction

- A personal point of view based on the results of our research, a literature review and many interviews and discussions with stakeholders from public independent research organisations
- **As ergonomist a post marketing point of view**
- **Focusing only on PPE is taking the problem backwards**
- What's at stake is to place the issue of PPE in the context of equipment design, work organisation and training
- Decision to use the conceptual framework of technology transfer to discuss the use of pesticides in the Gironde area vineyard work

# Reminder: general principles of prevention

Directive 89/391/EEC

The general principles of prevention distinguish three layers of prevention

:

- **Primary safety**, which consists *in avoiding the risk at the source, evaluating the risks that cannot be avoided*, or even in replacing a dangerous product or technology by less dangerous ones
- **Secondary safety**, which places collective or individual barriers when hazards cannot be eliminated at the source
- **Tertiary safety**, which consists in first aid and rescue in the event of an incident or contamination

If this is applied to the use of pesticides in France,

- Authorising (or not) a substance on the market must be seen as one form of primary safety.
- Protection and filtration booths or cabs must be seen as between collective and individual protection measures, whereas PPE are by definition **individual barriers**.

# 1. The anthropotechnology Frame

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## *Developed countries*

Technical system  
Organisation  
Human

## *Developing countries*

Technical' system  
Organisation'  
Human' ...

*Anthropotechnological islands?*

***“Any object or any system of production belongs to a particular cultural system, since the engineer who designed it, must necessarily take into consideration its future users and in this respect he thinks of those of his own country” Wisner et al. (1982)***

# A tractor cab could be that one, but ....



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28&29 OCTOBER 2014



## 2. LIMITATIONS IN THE DESIGN OF FILTERING CABS

- ☒ An evaluation of the real effectiveness of new filtering systems shows that they can filter dusts but even the best systems are not effective against aerosols.
- ☒ In a real work situations such performance is quickly compromised if the cabs are not completely airtight or if the filtering systems are not properly maintained.
- ☒ The joints of windows tend to dry out, shrink and twist out of shape, which makes it possible for the pesticides to penetrate into the cab.

# But the real life is ...



Occupational exposure to pesticides  
Challenges for research, evaluation and prevention

28&29 OCTOBER 2014



❖ *Those workers are mad, driving with their window opened!*

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Challenges for research, evaluation and prevention

28&29 OCTOBER 2014

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### 3. The real life of work organisation



### 3. The real life of work organisation



## 4. LIMITATIONS OF TRAINING PROGRAMMES

- ☒ Training has long been a favoured action in terms of pesticide risk prevention.
- ☒ For many years training programmes focusing on the prevention of risks associated to the use of pesticides were classroom based, with slideshow presentations.
- ☒ **Those training programmes have not bridged the gap between the recommendations they made and what was really (and realistically) put in place day after day in the field.**
- ☒ The equipment technical design and work organisation have long been neglected.
- ☒ Winegrowers were a prevention target to be reached by training programmes.
- ☒ The question the outsiders' risk representation is largely underestimated
- ☒ ***Farm workers are presented as resisting to training***

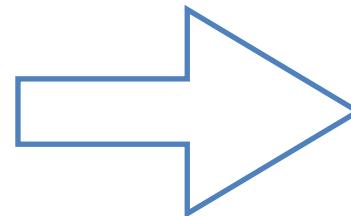
## 5. A DISCUSSION OF THE EFFECTIVENESS OF PPE

- ❖ Wearing PPE appears as the main prevention measure
- ❖ PPE are a visible token of prevention
- ❖ How to make sure that wearing PPE means real protection?
- ❖ For the workers wearing Ppe means to be protected

### 3. DISCUSSION OF THE EFFECTIVENESS OF PPE

Literature survey with «Pesticides & ppe » keywords

- 66 papers identified with Scopus
- 21 papers identified with Pascal
- 59 papers identified with Medline



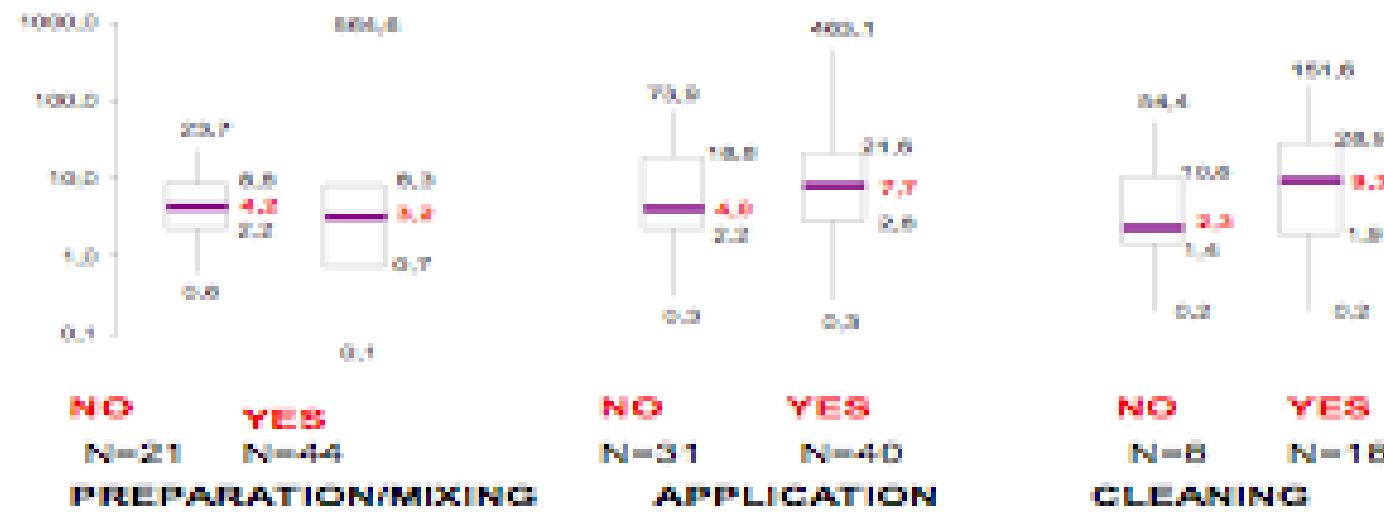
50 papers selected

Reasons why workers are wearing ppe or not	Working clothes efficiency against pesticides, field studies	Ppe efficiency against pesticides, field studies	Thermal Comfort of ppe	Effectiveness of prevention interventions	Evaluation of garment protection against pesticides in lab	Ppe & standadisation	Ppe & registration process
17 <i>In most of them the type of Ppe is not specified</i>	2	10 <i>Only 3 on water repellent, most of them in controlled conditions of ppe use</i>	2	6 <i>Not always significant effects of prevention</i>	7	3	3 <i>Level of protection used in the pre marketing models</i>

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# Pestexpo study based on 72 days of field studies observations

**External contamination (mg of active substance)  
in relation to whether coveralls\* are worn**  
PESTEXPO Grande (dithiocarbamates 2001-2002) Isabelle Bach



\*Shorts and/or t-shirt versus "protective" clothing

A riddle to solve: People who wear PPE are actually more contaminated!

### 3. DISCUSSION OF THE EFFECTIVENESS OF PPE

- ☒ The whistleblowing from the DGT and the request to AFSSET/ANSES
- ☒ The liquid breakthrough tests recommended by prevention institutions are carried out with sulphuric acid and sodium hydroxide solutions at different concentrations but never with the active principles contained in the pesticides!
- ☒ **This limitation has been known by industrialists for over 20 years**
- ☒ The effectiveness of the suits in terms of breakthrough and penetration depends on the specific interaction between the suit fabric and the active
- ☒ Resistance to penetration and permeation processes
- ☒ **A ppe never offers a complete protection: it has always a residual exposure**

Produits testés	Niveaux de performance obtenus sur le matériau du tablier (classe 1 étant la plus faible et classe 6 la plus élevée)
Résistance à la perméation Callisto, SC, concentré	Classe 6
Résistance à la perméation Camix, SE, concentré	Classe 2
Résistance à la perméation Celest Rev, FS, concentré	Classe 6
Résistance à la perméation Citadelle, SC, concentré	Classe 6
Résistance à la perméation Défi, EC, concentré	Classe 1
Résistance à la perméation Karate K, EC, concentré	Classe 1
Résistance à la perméation Karate Zeon, CS, concentré	Classe 1
Résistance à la perméation Koara, EC, concentré	Classe 1
Résistance à la perméation Lufox, EC, concentré	Classe 1
Résistance à la perméation Moddus, EC, concentré	Classe 3
Résistance à la perméation Reglone 2, SL, concentré	Classe 2
Résistance à la perméation Vertimec, EC, concentré	Classe 2

#### Taille et ajustement

Ce vêtement existe en une seule taille (medium, pour une stature de 170 à 185 cm). La longueur doit assurer un large recouvrement de la botte et peut être ajustée par simple découpage afin de permettre une marche facile. En cas d'encolure trop étroite pour le passage de la tête, pratiquer une fente verticale sur la face avant du tablier (ne pas échancrer pour conserver une bonne protection de la nuque).

Important : pour éviter tout risque d'accrochage, ne pas porter le tablier lâche et flottant. Le tour de taille doit être ajusté en pratiquant un nœud sur le cordon de fermeture. Veuillez réaliser un essayage pour un ajustement adapté à la taille de l'utilisateur avant toute première utilisation.

#### Fin d'activité et entretien du tablier

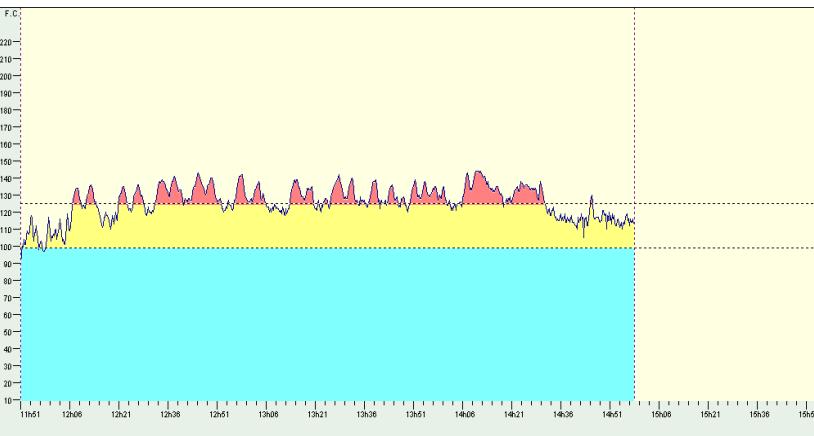
Laver les mains gantées pour retirer les équipements de protection (lunettes, masque) ainsi que le tablier.

Laver obligatoirement le tablier et les autres équipements après chaque usage.

Le lavage du tablier est possible sur l'opérateur lui-même, veiller à ne pas éclabousser le haut du corps et l'intérieur du tablier.

#### Stockage

## ***The stakes of the cardiac demand from exertion and thermoregulation***



Duration: 3h07mn

Average: 125 BPM

Duration of strenuous effort (red): 2h20 min

Duration of the moderate effort (yellow): 42 min



## 5. A DISCUSSION OF THE EFFECTIVENESS OF PPE

- + Registration of crop protection products are generally based on POEMs
- + These POEMs are based on operator exposure studies where operators had worn polyester/cotton or plain cotton coveralls
- + Polyester/cotton or plain cotton coveralls seem to prove to protect operators under practical use conditions within the lowest default value of 5% that is used in existing POEMs
- + Only for some high exposure scenarios where operators are in direct contact with wet (sprayed) leaves water impervious clothing is necessary

**Table 11:** Default personal protective equipment (PPE) (modified from EFSA, 2010)

Technical control/PPE item		Protection factor (by which exposure in absence of protection should be multiplied)	Specific exposure value affected
<b>Protective (chemical resistant) gloves<sup>o</sup></b>		Operators Liquids 10% Operators Solids 5%  Workers Solids 5% (	Dermal exposure – hands only
<b>Working clothing or uncertified cotton coverall</b>		Operators 10%	Dermal exposure – body only
<b>Protective coverall (this is used instead of working clothing/uncertified cotton coverall)</b>		Operators certified protective coverall 5%	Dermal exposure – body only
<b>Hood and visor*</b>		Operators 5%	Dermal exposure – head only
<b>Hood</b>		Operators 50%	Dermal exposure – head only
<b>RPE mask type</b>	<b>Filter type</b>		
<b>Half and full face masks</b>	<b>FP1, P1 and similar</b>	25%	Inhalation exposure
		80%	Dermal exposure – head only
	<b>FFP2, P2 and similar</b>	10%	Inhalation exposure
		80%	Dermal exposure – head only

<sup>o</sup>For manual application of granule formulations, the original exposure data were derived considering the use of PPE (gloves and coverall). For the non-PPE scenario a 100 times higher value is considered for hands and body.

\*Hood and visor are considered in alternative to the RPE

# 5. A DISCUSSION OF THE EFFECTIVENESS OF PPE

## Ppe & Autorisation to place on the market process :

- From « wear the suitable protection » **that has never been specified**
- To *« wear a cotton polyester with water repellent treatment »*
- Only 3 scientific publications on **water repellent** efficiency in controlled conditions
- After 5 washing some doubts on the efficiency
- The coverall producers have pointed out: the difficulty of producing homogeneous water repellent garments, the effect on Ultra Violet and the mechanical limits

# Discussion

- It's an illusion to believe that one generic suit can protect from all the pesticides
- What is the acceptable level of pesticides contamination even if ppe are worn?
  - Are the toxicological models and the definition of AOEL reliable? Is that possible to open such black boxes? Is that possible to trust closed models?
  - What happens with low doses in the cases of carcinogenic pesticides?

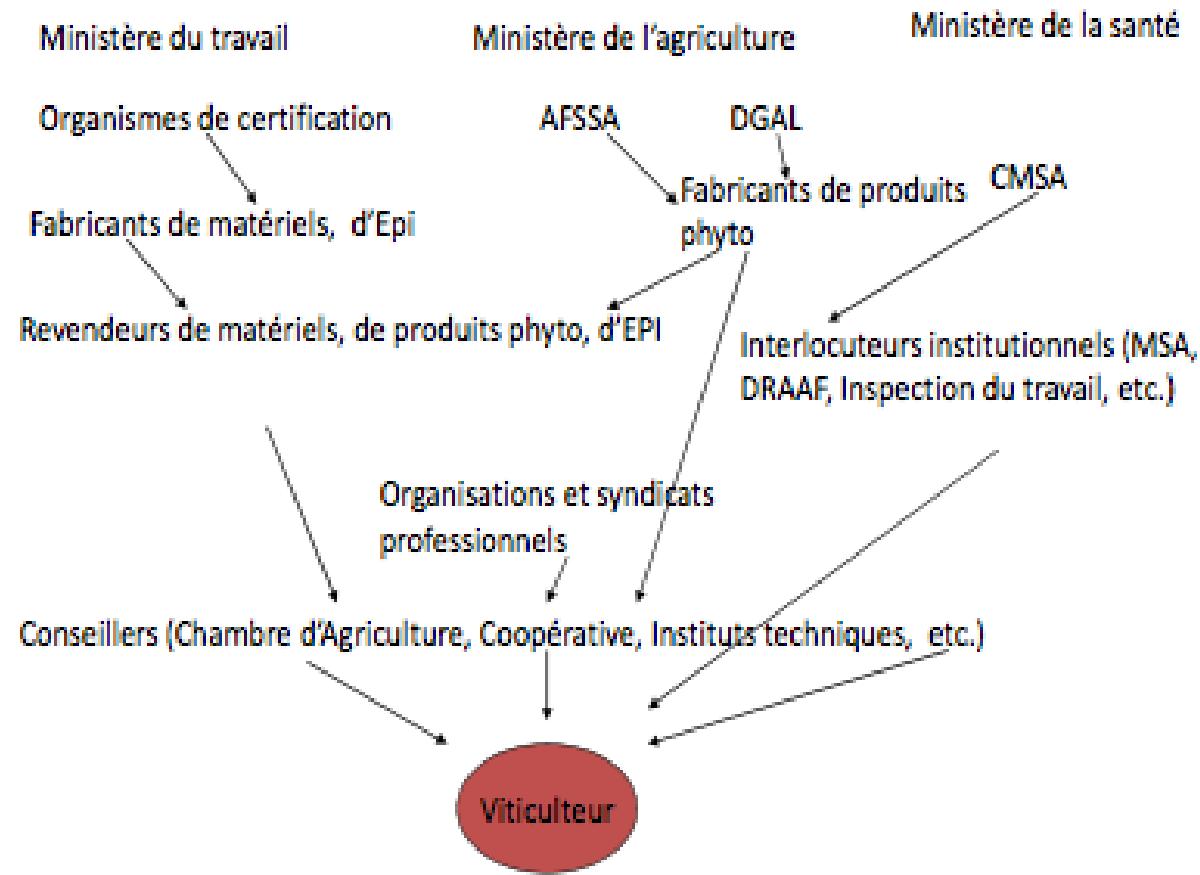


Figure 30 : l'activité des agriculteurs, une pratique sous dépendance ?

# Discussion

- Between the predicted level of risk (pre-marketing process) and the real situation of use (post-marketing process, who will evaluate the real level of pesticides exposure (Directive 89/391/EEC)?
- Are the limits of real use situations taken into account in the models of authorization to place pesticides on the market?
- A better definition of PPE to wear (even they does not protect totally, even if the technical and organisational design have to be improved) a strategy to transfer the legal responsibility of diseases to the end users?

# Perspectives

- ❖ Analysing vineyard workers activity showed that there were discrepancies between:
  - ❖ « anticipated » uses and real uses
  - ❖ « predicted » level of exposure and real level of exposure
- ❖ Protecting oneself against pesticides becomes a complex activity in itself:
  - ✖ Complex prevention measures become inapplicable in real work situations;
  - ✖ Shortcomings in the design stages hinder prevention
- ❖ So-called “outsiders’ risk perceptions” are largely underestimated
- ❖ Necessity to place vineyard workers in the centre of the design and prevention processes
- ❖ From a **bad behavior** to a more **culturalist approach**